

95-G-046

FAA CENTER FOR AVIATION SYSTEMS RELIABILITY PROGRAM

**Development of NDI Education and Training Approaches for the Aviation
Industry**

**Final Project Report on Adaptation of the Current Course NDI for ASIs to a
CD-ROM Format**

**Principle Investigators: Lisa Brasche, Anita Ousley
Final Report
March 1998**

potential for CBT in improving training in aviation maintenance. It is anticipated that the experience gained through this project will help in providing improved future training programs that will afford the CBT training benefits outlined in the article. Potential benefits include:

- training available on demand
- lower training costs associated with traveling to classes
- improved breadth and quality of training
- more standardized training
- reduced situations in which new recruits learn poor work habits from other employees
- updated materials delivered to any location quickly
- ability to receive training or review material at the exact time it's needed (i.e., in a hangar, prior to an inspection)

Acknowledgments

This work was funded by the FAA William J. Hughes Technical Center under grant number 95-G-046. Reviewers from the aviation community, FAA, and community colleges are gratefully acknowledged for their contributions to the product. A particular thanks to the Boeing Commercial Airplane Group and Panametrics Co. for contributing photographs. Support from FAA-CASR staff and students for their contributions is also acknowledged. The contributions and support of Alfred L. Broz, FAA National Resource Specialist for NDE, and Carmen S. Delgado, NDI Course Manager-FAA Academy are appreciated. In addition, the guidance of the FAA NDT Training Design Panel are gratefully acknowledged: Bernie Borenstein, Lisa Brasche, Carmen Delgado, John Fabry, Alfred L. Broz, Robert Guyotte, Chris J. Heizer, Bruce A. Kotzian, Isabel Kulick, Nancy C. Lane, and Fred Sobeck.

beta testing at the end of September 1997, about 5 months beyond the initially anticipated schedule. Subsequently, a no cost extension was requested that would allow time for conducting a beta test before producing the final product for distribution. The extension was granted and the beta test was initiated in October.

Beta Testing

The prototype course on CD-ROM was sent to 25 reviewers along with an extensive evaluation form soliciting comments and recommendations. Feedback was requested regarding the content of the CD, ease of use, operational problems, and open remarks. Over the ensuing 6 to 8 weeks, input was received from 15 individuals who reviewed all or parts of the CD. Overall comments on the need for CBT, in general, in this area were very positive.

A large percentage of the individual remarks centered on recommendations for improvement of the content and presentation of the material. A few comments were in regard to problems of a technical nature or with operation of the CD. In addition, of concern in most evaluations was the notion that any type of CBT training program needs to be easy to use and not require that the trainee have a great deal of computer or technical skills. Also, suggested was a method for electronically timing and recording, in an external file, the amount of time a user spends working on a CBT program, so a course administrator could access that information. Electronically recorded grades and hours spent on CBT exercises could then become a part of an individual's permanent training record..

Through notable efforts of the reviewers, useful recommendations were received, that allowed the final product to be much improved over the beta version. Overall, the beta test element proved to be an invaluable part of this project and future education and training projects. Many reviewers made general, overall comments and recommendations that were important not

only for this particular training CD, but that will be important to the success of future CBT projects, as well.

Final Result

The final product of this project resulted in a CD-ROM course for aviation safety inspectors, that models the course *NDI for ASIs*, currently offered at the FAA academy. It is anticipated that concern, over accommodating the increasing number of students enrolling in the academy course, can be somewhat alleviated by having the information available for individual, self-instruction. The CD-ROM course was very well accepted by the academy course administrator who indicated that it would be useful in delivering the current course to a larger group. In addition, inquiries from individuals representing community colleges, airline industry partners, and the navy, about the availability of the CD have already been received. At the writing of this report, the final CD product is in the process of being duplicated and packed for distribution. Five hundred copies will be made and anticipated duplication time is two weeks.

In summary, the industry continues to define the need for high quality, standardized tools for NDI training. Previous tools developed as part of the CASR Education and Training program are currently in use across the industry as part of their training and development efforts. Previous research (*Tech Trends*, vol. 37, no. 2, 1992) on CBT has indicated that computer-based lessons can be more effective than conventional training on the same topics. Advantages reported include: increased interaction, individualization, cost effectiveness, motivation, immediate feedback, and lesson integrity and control.

The results of the pilot project, described in this report, are of great importance in providing guidance to training developers regarding the advantages and limitations of using the CBT approach for NDI instruction in aviation. A recent article in the September 2 issue of *Aviation Week & Space Technology*, *Maintenance Training Undergoes Review*, notes the

Development of CD-ROM

The goals of the CD course are (1) to introduce a process that will help the aviation safety inspector (ASI) determine if nondestructive inspection (NDI) facilities are operated and inspections performed in accordance with established procedures, and (2) to serve as refresher material on the basic ASI functions of audit, evaluation, and surveillance as it applies to NDI facilities. Structure of the initial *NDI for ASIs* course determined that the contents of the CD would contain sections as follows: an introduction, certification of NDI facilities, an NDI facilities checklist, and one section for each of the common NDI techniques, visual, liquid penetrant, magnetic particle, eddy current, ultrasonics, and radiography. The structure of the CD also incorporates sound, video, animation, and other graphics to assist in comprehension and reinforcement of the material.

Since multimedia CBT development was a relatively new venture for CASR, the equipment and operations for undertaking such a project needed to be instituted. After a period of analyzing hardware, software, and other equipment for CBT development, the set up was established in early 1996. Work progressed smoothly throughout the first couple of quarters with only occasional minor delays, which are to be expected in the initial stages of a new operation. Shortly into the third quarter, it was apparent that additional computer hardware (video editing capabilities) would be needed for the project. Progress lagged slightly while consultation and search for the precise equipment was conducted. The additional equipment was initially received in early summer, but was found to be incompatible with the current computer system, and inappropriate for the intended use. The search for appropriate computer video editing equipment was again underway. Despite these setbacks, the first demo of the CD was released for review in mid summer and was well received.

In Fall 1996, the computer video editing capabilities were in place and progress on the development began to move rapidly forward. A complete prototype was ready for review and

Introduction

The pilot project described in this report was performed at the FAA Center for Aviation Systems Reliability (FAA-CASR) at Iowa State University, and was funded by grant number 95-G-046 from the Federal Aviation Administration. It is a result of ongoing efforts to provide the aviation community research into the development of modern instructional methods and materials that focus on nondestructive inspection (NDI), are specific to the aviation community, and are designed to meet their needs. The scope of this project includes training of the aviation safety inspector (ASI) in NDI content as it relates to the ASI job functions. The resulting product, a CD-ROM course, is an adaptation of the current course, *NDI for ASIs*, offered at the FAA academy. The anticipation that the result of this project would provide valuable insight into the realm of NDI training in the aviation industry, raised two broad questions. First, would training and education delivered through the use of modern learning technologies be as accepted, used, and effective as the traditional classroom approach to delivering the course. Second, would computer based training (CBT) render its proposed benefits of allowing exposure of the course to a larger audience than is possible with classroom course delivery.

Broadly stated, the approach involved five steps: (1) solicit industrial input in the definition of training needs and review of materials. (2) adapt the previously developed NDI for ASI training course material to a computer based format deliverable on CD-ROM, (3) develop a prototype CD and send to reviewers for beta testing, (4) record and incorporate reviewer recommendations, and (5) copy and distribute final CD to industry, community colleges, and applicable governmental agencies. The content material that appears in the CD course was previously selected and recognized by the FAA Training Design Panel responsible for the design of the initial course entitled *NDI for ASIs*.